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A revision of Afrotropical *Astochia* Becker, 1913 with descriptions of three new species (Diptera, Asilidae, Asilini)

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Abstract

Afrotropical *Astochia* Becker, 1913 are taxonomically reviewed. Three new species are described (*A. lumarius* **sp. nov.** (Malawi), *A. silva* **sp. nov.** (Kenya, Burundi), *A. similis* **sp. nov.** (Nigeria)) and added to those already known (*A. africana* (Ricardo, 1919), *A. armata* (Becker, 1909), *A. neavensis* (Ricardo, 1919), *A. sodalis* (Wulp, 1899), *A. strachani* Oldroyd, 1970). A key to aid in species identification is provided in addition to notes on their distribution, phenology and biology.

Keywords

Assassin flies, robberflies, taxonomy

Introduction

The taxonomic history of Afrotropical *Astochia* Becker, 1913 is brief and can be summarised as follows:

van der Wulp (1899) – Described *Itamus sodalis* from 'Haithalhim and Lahej' in the neighbourhood of Aden (Yemen).

Becker (1909) – Described *Neoitamus armata* from 'l'Afrique orientale anglaise' (= Kenya).

Becker (1913) – Described *Astochia* with *A. metatarsata* from 'Persia' (= Iran) being the only species, and discussed the reasons he did not include the species in *Neoitamus* Osten-Sacken, 1878.

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Ricardo (1919) – Described *Neoitamus africana* from Kenya and *N. neavensis* from the 'Congo Free State' (= Democratic Republic of Congo or DRC).

Hull (1962) – Included *Astochia* in his key to the genera of Asilini, listing only Palaearctic (including *A. sodalis*) and Oriental species. He also keyed out *Neoitamus* listing five Ethiopian (= Afrotropical) species (*N. africanus*, *N. armatus*, *N. morio* Bezzi, 1914, *N. neavensis* and *N. podagricus* Bezzi, 1914).

Notes: *N. morio* was originally described in *Neolaparus* Williston, 1899 (now a synonym of *Pegesimallus* Loew, 1858), not *Neoitamus*, and is currently considered a synonym of *Pegesimallus moerens* (Wiedemann, 1828) (Londt, 1980). *N. podagricus* is currently considered a valid species of *Hoplopheromerus* Becker, 1925 (Oldroyd 1980).

Oldroyd (1970) – Described *A. strachani* from Nigeria and the DRC.

Oldroyd (1980) – Catalogued the five recorded Afrotropical species: *A. africana*, *A. armata*, *A. neavensis*, *A. sodalis*, *A. strachani*.

Londt (1982) – Discussed and reviewed the Afrotropical fauna, providing redescriptions and a key to the five then known species. Male terminalia were illustrated with the exception of *A. neavensis*, represented only by females.

Londt and Dikow (2017) – Included the genus in a key to Afrotropical Asilidae genera, and summarised the current state of knowledge.

There were five described species of *Astochia* recorded for the Afrotropical Region at the commencement of this study (those listed by Oldroyd (1980) and reviewed by Londt (1982)). With the description of three species new to science the number is here extended to eight.

Astochia is a fairly widely distributed genus. Catalogues record species from the Oriental Region (e.g. Oldroyd 1975), the Palaearctic Region, including the type species, *A. metatarsata* Becker, 1913 from Iran (Lehr 1988) and the Australasian & Oceanian Region (Daniels 1989). The genus has not been recorded from either the Neotropical Region (Martin and Papavero 1970) or Nearctic Region (Fisher and Wilcox 1997).

Astochia appears to be closely related to *Neoitamus* Osten-Sacken, 1878 and although currently accepted as a valid genus (see Londt (1982) further research and analysis is probably required in order to substantiate this placement.

Materials and methods

The terminology that follows is that mainly proposed by Cumming and Wood (2017) and Londt and Dikow (2017). Recoded specimens are housed in the following institutions:

BMNH The Natural History Museum, London, England.
DMSA Durban Natural Science Museum, Durban, South Africa.
ICIPE International Centre of Insect Physiology and Ecology, Nairobi, Kenya.

MRAC Musee Royal de l'Afrique Centrale, Tervuren, Belgium.
NMSA KwaZulu-Natal Museum, Pietermaritzburg, South Africa.
USNM National Museum of Natural History, Smithsonian Institution, Washington, United States of America.

Material listed for each species is arranged according to geographical coordinates within countries (alphabetically arranged). Material previously listed in publications is relisted in order to provide as complete a record of localities, dates of collection and field notes as possible. When available, label data are cited as they appear on labels, lines of information being separated by a slash (/). Database numbers, when available, are also provided. While more recently collected material is frequently provided with detailed information relating to locality and habitat, it has been necessary to attempt to establish reasonably accurate geographic coordinates for older or relatively poorly documented specimens in order to gain a better understanding of distribution. Google Earth and the Internet have been used to accomplish this. Information considered relevant, but not appearing on labels, is provided in square brackets. Illustrated wings were removed and placed in alcohol between glass microscope slides for photography. These were then dried and reattached to specimens with clear nail varnish or mounted on card and attached to the pins of the relevant specimens. Male terminalia were excised, macerated in hot Potassium Hydroxide, washed in 96% ethanol, drawn with the aid of a drawing tube before being stored in micro vials containing a mixture of alcohol and glycerine before being attached to the relevant specimen pins.

Taxonomy

Astochia Becker, 1913

Astochia Becker, 1913: 538. Type species: *Astochia metatarsata* Becker, 1913 (Taf. XII fig. 9 (head)), by monotypy.

Diagnosis. Based largely on the key characters used by Londt and Dikow (2017). Head: Antennal stylus lacking setulae. Palpus 1-segmented. Thorax: Anepisternum lacking strong macrosetae at superoposterior angle. Anatergite setose. Postmetacoxal area membranous. Wings: Alula well developed. Cells r_1 m_3 and *cua* closed at or before wing margin. Legs: Fore tibia without distal spine-like processes. Tarsi with well-developed pulvilli. Abdomen: Tergite 2 not more than 4× as long as wide, sternite 1 confined beneath tergite 1. ♀ with segments 1–5 pruinose (1–6 in *A. sodalis*), terminal four segments apruinose (three in *A. sodalis*), forming a telescopic ovipositor.

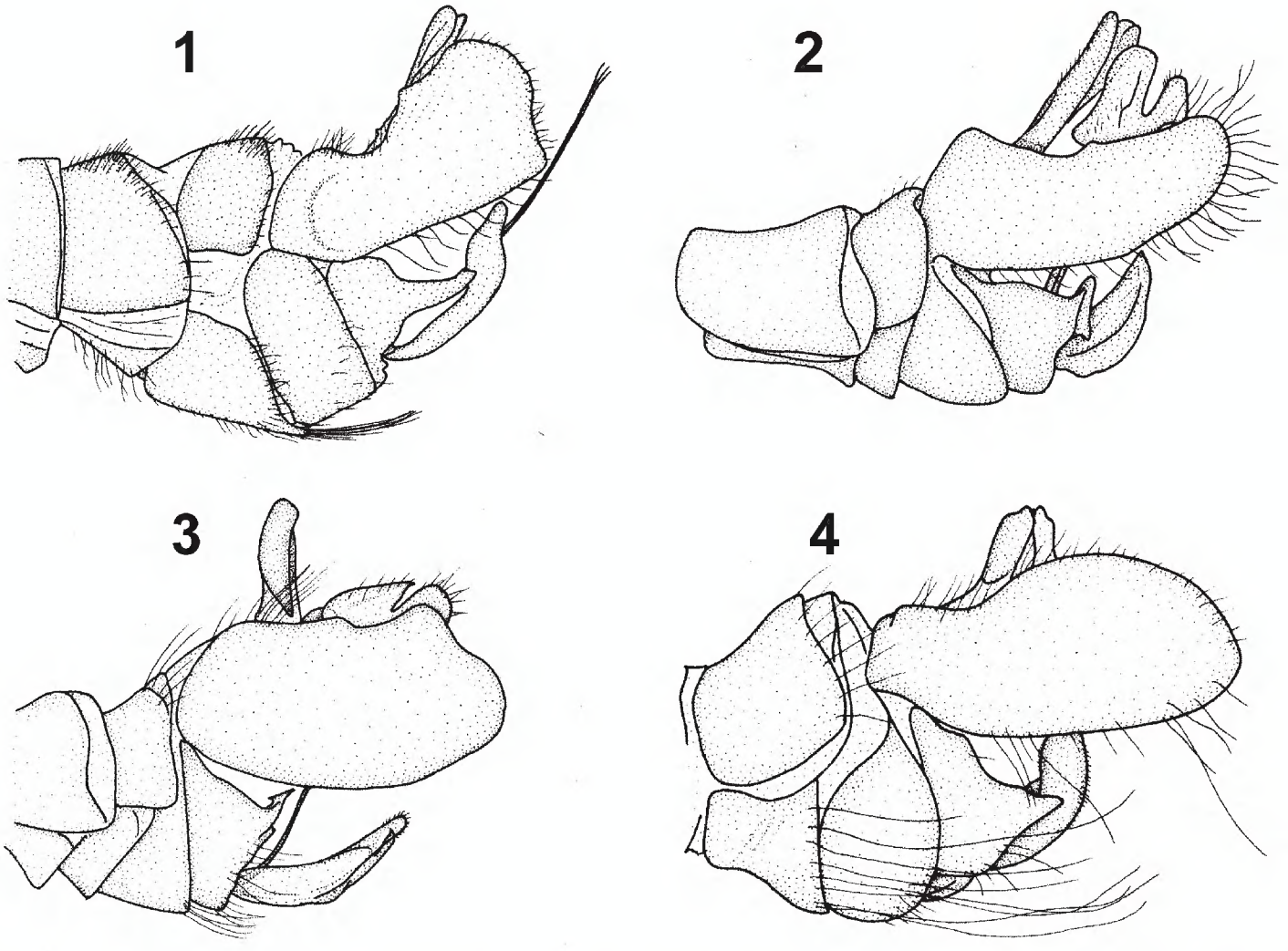
Note. The key to genera published by Londt and Dikow (2017) is now partly defective in as much as couplet 136 states that the scutellum has fewer than 4 apical macrosetae. The newly described *A. silva* possesses four or more such macrosetae.

***Astochia africana* (Ricardo, 1919)**
Figs 1, 25

Neoitamus africanus Ricardo, 1919: 73; Oldroyd 1939: 38; Hull 1962: 557; Oldroyd 1970: 313.
Astochia africana: Oldroyd 1980: 336; Londt 1982: 243 (figs 2 (wing), 3 (♀ ovipositor), 5–7 (♂ terminalia)).

Diagnosis. Mystax black. Katatergal setae black. Anatergite with black and white setae. Scutellum disc with black setae. Mesonotal macrosetae black. Wings: Discal cell microtrichose. Legs: Femora entirely black. Metathoracic femora with ventral macrosetae. ♀ with abdominal segments 1–5 pruinose. ♂ terminalia as in Fig. 1. The species was fully redescribed by Londt (1982).

Material. Previously recorded and personally studied material: Kenya: 3♀, lectotype & paralectotypes, Edge of forest on S & E slopes of Mt Kenya [*c.* 00°10'S, 37°26'E 3000m], 6000–7000 ft [*c.* 2000 m], 3–12.ii.1911, S.A. Neave (BMNH); 1♂ 2♀, 5–7 miles into Kenia Forest, near Luche [?] R. 9–10.ii.1911, T.J. Anderson (BMNH). Malawi: 2♂ 3♀ [Londt (1982) recorded 2♂ 4♀] 'Malawi Ntchisi Forest / Reserve 1334Ac 1500m [13°22'43"S, 34°01'17"E *c.* 1420m] / Londt & Stuckenberg



Figures 1–4. Lateral views of *Astochia* male terminalia as illustrated by Londt (1982): **1** *A. africana* **2** *A. armata* **3** *A. sodalis* **4** *A. strachani*.

/ 3–4.xii.1980 Montane / forest & woodland', 1♂ 'NMSA-DIP-03374'; 1♂ 'NMSA-DIP-106705'; 3♀ 'NMSA-DIP-106706-8' (NMSA). Uganda: 1♂ 1♀, Ruwenzori range [*c.* 00°23'N, 29°52'E], Namwamba Valley, 6500 ft [*c.* 1980 m], xii.1934–i.1935, B.M. E. Afr. Exp., F.W. Edwards (BMNH).

Material not studied but recorded by Oldroyd (1970): DRC: 1♀, Stanleyville [= Kisangani], Mahagi-Niarembe [*c.* 02°16'N, 31°03'E 1550m], x.1935, Ch. Scops (MRAC); 1♀, Muturak [?], 3.ii.1933, Van Sacaghem (MRAC). Rwanda: 1♀, Kivu, Kisenyi [= Gisenyi *c.* 01°41'S, 29°16'E 1550m], ii.1928, Ch. Seydel (MRAC); 1♂, Kisenyi, 1800 m, 18.xi.1961, A. Bertrand (MRAC).

Newly recorded material: Kenya: 1♀ 'Kenya: Nairobi #58 / Karura State Forest / 01°15'S, 36°53'E 1700m / 19.xi.1992 5 km NE city / J Londt & A Whittington / indigenous forest/edges', 'NMSA-DIP-03364' (NMSA). Malawi: 1♀ 'C Malawi Ntchisi District / Ntchisi Forest Reserve [*c.* 13°22'43"S, 34°01'17"E 1420m] / 5000ft [*c.* 1525 m] 24 Nov – 2 Dec 2000 / Collector R J Murphy / Det Ref No AS21' 'NMSA-DIP-106709' (NMSA). Tanzania: 1♀ 'van Someren / Mt Moroto [*c.* 2°32'S, 34°46'E] / Kar moya [?] 4 50', 'Com Inst Ent. / Coll. No. 11740' (BMNH).

Distribution, phenology and biology. Recorded mainly from East Africa (Kenya, Malawi, Rwanda, Tanzania and Uganda) and eastern DRC (Fig. 25). Collected from October through to February (Table 1), no records for January. Found mainly associated with indigenous forest environments.

***Astochia armata* (Becker, 1909)**
Figs 2, 5, 25

Neoitamus armatus Becker, 1909: 114; Becker 1910: 22; Hull 1962: 557.
Astochia armata: Lindner 1955: 41; Oldroyd 1970: 312 (fig. 78 (♂ terminalia)); Oldroyd 1980: 336; Londt 1982: 245 (figs 1 (entire ♂, 7 wing, 8–10 ♂ terminalia)).

Diagnosis. Mystax whitish. Katatergal setae white. Anatergite with white setae. Scutellum disc with white setae. Mesonotal macrosetae black. Wings: Discal cell lacking microtrichia. Legs: Femora black and yellow-brown. Metathoracic femora lacking ventral macrosetae. ♀ with abdominal segments 1–5 pruinose. ♂ terminalia as in Fig. 2. The species was fully redescribed by Londt (1982).

Material. Previously recorded and personally studied material: Kenya: 1♂, Livingippe (or Lorengippe illegible) Turkana [*c.* 03°07'N, 35°36'E 500m], 30.iii.1976, E.E. Brown (BMNH). Malawi: 1♂ 1♀ '♂ + ♀ / in copulo', 'Malawi Senga Hills [*c.* 13°42'S, 34°35'E 480m] / 1–2.xii.1980 1334DA / ca. 500m Stuckenberg / & Londt *Brachystegia* / woodland near lake' 1♂ 1♀ (pinned together) 'NMSA-DIP-106712' (NMSA); 4♂ 3♀ 'Malawi Senga Hills / 1–2.xii.1980 1334DA / ca. 500m Stuckenberg / & Londt *Brachystegia* / woodland near lake' 1♂ 'NMSA-DIP-03375'; 1♂ 1♀ 'NMSA-DIP-106710-1'; 1♂ 1♀ 'NMSA-DIP-106729-30' (NMSA). South Africa: 1♂ 1♀ 'S. Africa: Transvaal / 30km W Hoedspruit [*c.* 24°26'S, 30°37'E 580m] / 27/xi.1978 / Brothers & J-Guillarmod', 1♂ 'NMSA-DIP-106713'; 1♀ 'NMSA-

Table 1. Phenology of *Astochia* species. Months commencing from July.

Species	J	A	S	O	N	D	J	F	M	A	M	J
A. africana	–	–	–	1	3	7	–	8	–	–	–	–
A. armata	–	–	–	8	17	9	4	4	1	5	–	–
A. lumarius	–	–	–	–	1	1	–	–	–	–	–	–
A. neavensis	–	–	–	8	1	–	–	–	–	–	–	–
A. silva	–	–	–	–	3	–	–	1	1	–	–	–
A. similis	–	–	–	–	–	–	–	1	–	–	–	–
A. sodalis	3	–	–	–	–	–	–	–	–	–	–	–
A. strachani	–	6	1	4	3	–	–	–	1	8	–	–
Totals	3	16	1	21	28	17	4	14	3	13	0	0

DIP-03370' (NMSA); 3♂ 4♀, Junction of Blaauw Krantz and Tugela R. [?], x.1896, G.A.K. Marshall (BMNH); 1♂, Insuzi River nr. Qudeni [*c.* 28°36'S, 30°52'E 1605m], 25.ii.1962, A.L. Bevis (DMSA). Zimbabwe: 2♀, by Sanyati R., [*c.* 16°54'S, 28°48'E 890m] nr. Kariba Camp, Tsetse Fly Ops., 8.i.1956, R. Goodier, found in sandy area by river bank [only 1♀ recorded in 1982] (BMNH).

Material not studied but recorded by other authors: DRC: 2♀, Garamba National Park [*c.* 04°10'S, 29°30'E 800m], 28.ii.1951; 1♀, same locality, 20.iii.1950 [recorded by Oldroyd (1970) – repository probably MRAC]. Kenya: 1♂ 1♀ types (? Syntypes), Voi [*c.* 03°23'S, 38°33'E 575m], 1906 [recoded by Becker (1909) – repository unknown]. Tanzania: 2♂, Dar-es-Salaam [*c.* 06°48'S, 39°12'E 70m], Mburumfluss, 21 bis 24.xii.1951 [recorded by Lindner (1955) – repository probably Koninklijk Museum voor Midden-Africa, Tervuren.

Newly recorded material: Kenya: 1♀ 'Lorogumu [? Lorugum *c.* 2°53'29"N, 35°16'14"E 615m] / Turcana / Kenya / 13.4.54' (BMNH); 3♂ 1♀ 'Lorogumu / Turcana / Kenya / 14.4.54' (BMNH); 1♂ 'Kenya: Kajiado Dist. / Nguruman area 700m / 01°50'S, 36°56'E / Coll: I, Abu-Zinid / Date: 25.xi.1989', 'NMSA-DIP-03359' (NMSA); 1♀ 'Kenya, Coast Prov. / Kasigau Mtn. / bottom of forest. 737m. / 3.82080S, 38.64178E [*c.* 03°49'15"S, 38°38'31"E 730m]', 'Malaise trap. Woodland / with grass / 5–19 Oct 2011 / R. Copeland', '2777' (ICIPE). South Africa: 1♀ Wylie's Poort [Wyllie's Poort 22°55'18"S, 29°55'43"E 965m], 5.xi.1920, C.J. Swierstra 'USNMENT01518183'; 1♂ 'S Africa: N Province #56 / Ben Lavin Nature Reserve / 23°08'S, 29°57'E 2700 ft [*c.* 825 m] / Date: 20.xi.1997 / Coll: Barraclough & Jones / Malaise trap', 'NMSA-DIP-03363' (NMSA); 4♂ 8♀ 'R.S.A: KZ-Natal #77 / Itala Game Reserve / 27°28'S, 31°17'E 450 m / Date: 5.xi.1997 / Coll: J.G.H. & A. Londt / Pongola River', 1♂ 'NMSA-DIP-03365'; 6♀ 'NMSA-DIP-106715-20'; 2♂ 2♀ 'NMSA-DIP-61406-9' (NMSA); 2♂ 'RSA: KZ-Natal #48 / Hluhluwe Game Reserve / 28°05'S, 32°02'E 180 m / Date: 12–15.i.1995 / Coll: D.A. Barraclough / For. Margins + riv. gullies', 1♂ 'NMSA-DIP-03361'; 1♂ 'NMSA-DIP-106721' (NMSA); 1♀ South Africa: KwaZulu-Natal: Mhlopeni Nature Reserve, 29°01'13"S, 030°25'01"E, 860 m, 2004–02–13, Acacia savannah, Londt, J., Dikow, T. (USNMENT00914291).

Figure 5. *Astochia armata* habitat at Mhlopeni Nature Reserve (Photo: Torsten Dikow – 13 February 2004).

Figure 6. *Astochia armata* habitat at Kasigau Mountain (Photo: Bob Copeland – 19 May 2011).

Distribution, phenology and biology. Widely distributed from East Africa (Kenya, Malawi, Tanzania) and eastern DRC to Southern Africa (South Africa, Zimbabwe) (Fig. 25). Collected from October through to April (Table 1). Found associated with forest margins, woodland and more open savannah environments. A few specimens have been found close to rivers. Fig. 5 shows the habitat in which the species was collected at Mhlopeni Nature Reserve in South Africa, while Fig. 6 shows the malaise trap environment at Kasigau Mountain in Kenya.

***Astochia lumarius* sp. nov.**
http://zoobank.org/E985A78D-1A94-496D-8F1B-EA1A1C5C847A
Figs 7–9, 26

Etymology. L. *luma* f. thorn, *lumarius* – of thorns. Named after the thorny projections found on the male epandrium.

Description. Based mainly on holotype, in reasonable condition although greasy (therefore masking pruinescence), with notes on the somewhat teneral female paratype, with paler coloration and slightly buckled wings.

***Head*:** Dark red-brown to black, black and white setose. Antenna dark red-brown to black, scape and pedicel black setose, postpedicel slightly laterally compressed. Relative lengths of segments (scape as 1) scape 1, pedicel 0.54, postpedicel 1.25, style 2.00 (0.18: 1.71: 0.11 – composed of a short basal element followed by a long, thin, stylus tipped with a tiny seta-like sensory element). Face black, ventral 2/3 protuberant. Mystax mainly black with some white macrosetae along epistomal margin, confined to protuberance. Frons black. Vertex black, strongly concave. Ocellar tubercle with *c.* 10 weak to moderately developed ocellar macrosetae. Occiput black (dorsally and along dorsal eye margins) and fine white (ventrally) setose. Palps black, one-segmented, black (distally) and white (proximally) setose. Proboscis dark red-brown to black, straight, white setose.

***Thorax*:** Dark red-brown to black, black and white setose. Antepronotum dark red-brown, black and white setose. Mesonotum black, postpronotal lobe orange-brown, entirely black setose except for some white setae on postpronotal lobe. Lateral macrosetae black (2 notopleurals, 2 supra-alars, 2 postalars). Scutellum dark red-brown

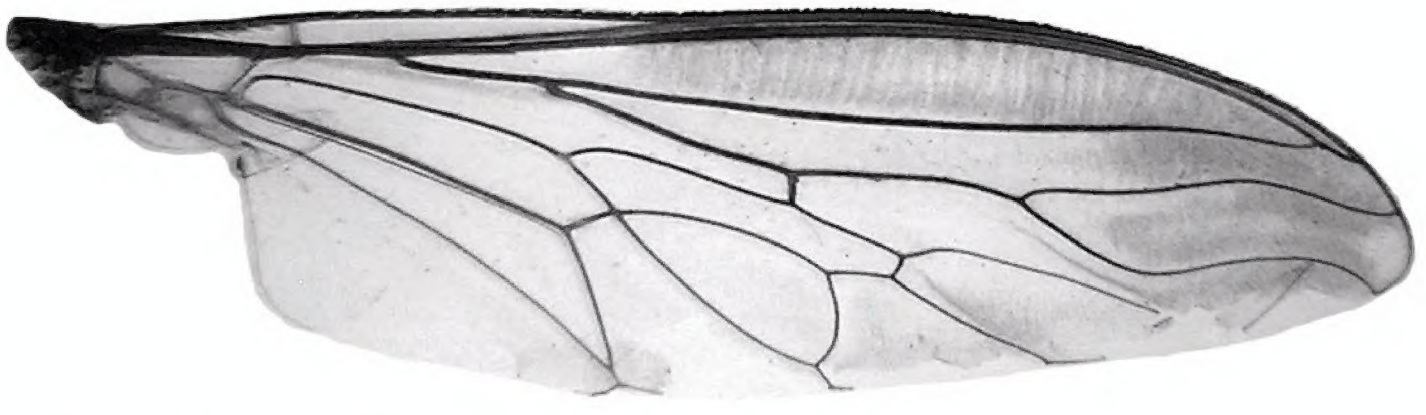
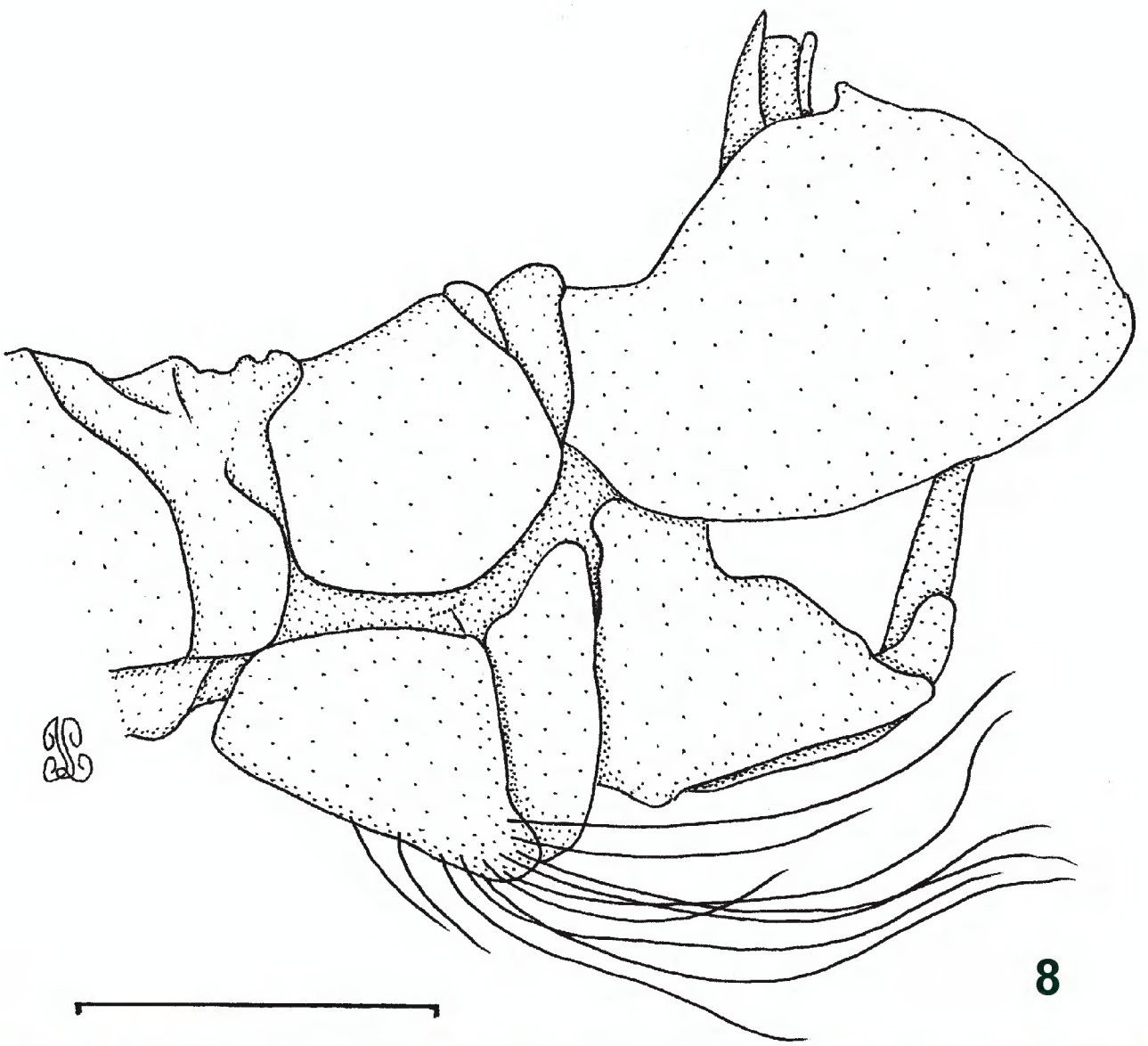
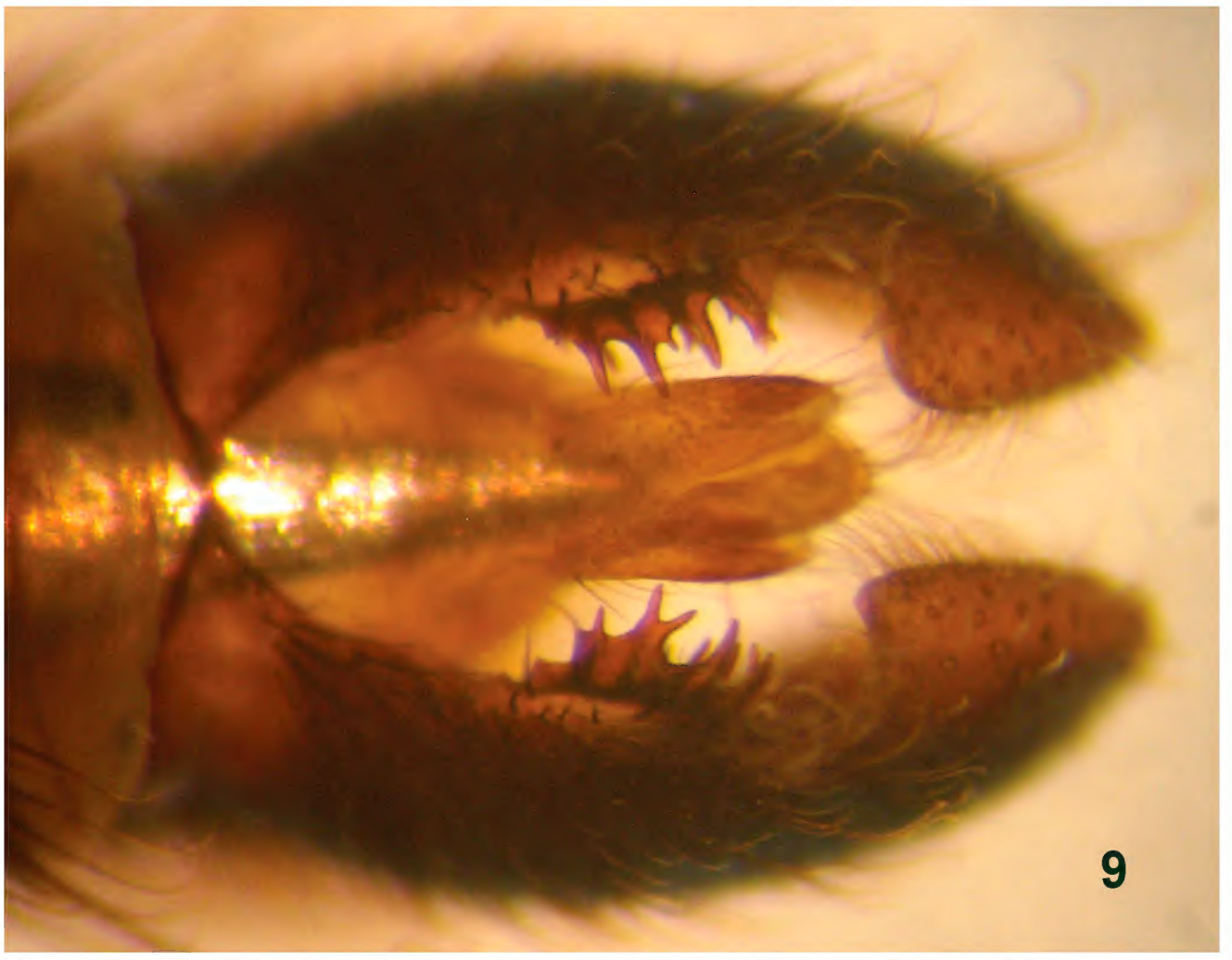


Figure 7. *A. lumarius* sp.nov. holotype wing.





Figures 8, 9. *Astochia lumarius* sp. nov. holotype male terminalia: **8** lateral **9** dorsal. Scale bar: 1 mm.

to black, with 3 black apical scutellar macrosetae, disc fine white setose. Pleura dark red-brown to black, fine black and white setose. Katatergal setae moderately well developed, black. Anatergites fine white setose. Postmetacoxal area membranous.

***Legs*:** Orange-brown except for anterior faces of femora which are black. Coxae mostly fine white setose. Trochanters weakly black and white setose. Femora with macrosetae black, minor setae white. Tibiae and tarsi entirely black setose. Claws, pulvilli and empodia well developed.

Wings: (Fig. 7) Length 10.7 mm (humeral crossvein to tip) × breadth 3.5 mm (maximum). Veins dark redbrown to black, membrane transparent, marginally microtrichose, centrally lacking microtrichia, cells m_3 and *cua* closed and stalked.

Abdomen: Dark red-brown to black, white setose except for terminalia which are mostly black setose.

Male terminalia: (Figs 8, 9): Unrotated. S8 with posterior region slightly protruding distally and equipped with long black setae distally (Fig. 8). Epandrium subcircular in lateral view, only slightly longer than high, left and right lobes narrowly joined proximally, with a complex arrangement of dorsally situated thorny processes opposing each other at midlength, best observed in dorsal view (Fig. 9). Hypandrium relatively small, without obvious lobes. Gonocoxite well-developed, subtriangular in lateral view. Gonostylus moderately developed, slightly dorsally upturned distally. Aedeagus long, terminating in slender filaments.

Female: Similar to ♂ except for the following features. Head mainly orange-brown, strongly gold-silver pruinose. Antennal scape and pedicel orange. Thorax mainly orange-brown, gold-silver pruinose except for longitudinal dorsal bands, black setose. Antepronotum orange, mainly white setose. Scutellar disc with a few black setae amongst white ones. Anatergites black and white setose. Femora only slightly darker anteriorly. Tibiae with some minor setae white. Wing (slightly warped) 12.5 × 3.8 mm. Abdomen orange-brown. T1 entirely white setose, other tergites black and white microsetose. T1–5 dull gold pruinose, T6–9 apruinose and modified into a telescopic ovipositor.

Type material. Holotype. Malawi: 1♂ 'Malawi Chimaliro / forest reserve [*c.* 12°27'S, 33°33'E] 1200m / 1233Bc Stuckenberg & / Londt 9.xii.1980 / *Brachystegia* woodland', 'NMSA-DIP-03376' (NMSA).

Paratype: 1♀ 'M 4383 / Zomba Plateau [*c.* 15°20'S, 35°19'E 1755m] / Malawi xi.13.73 / Coll. C. Dudley' 'NMSA-DIP-14498' (NMSA).

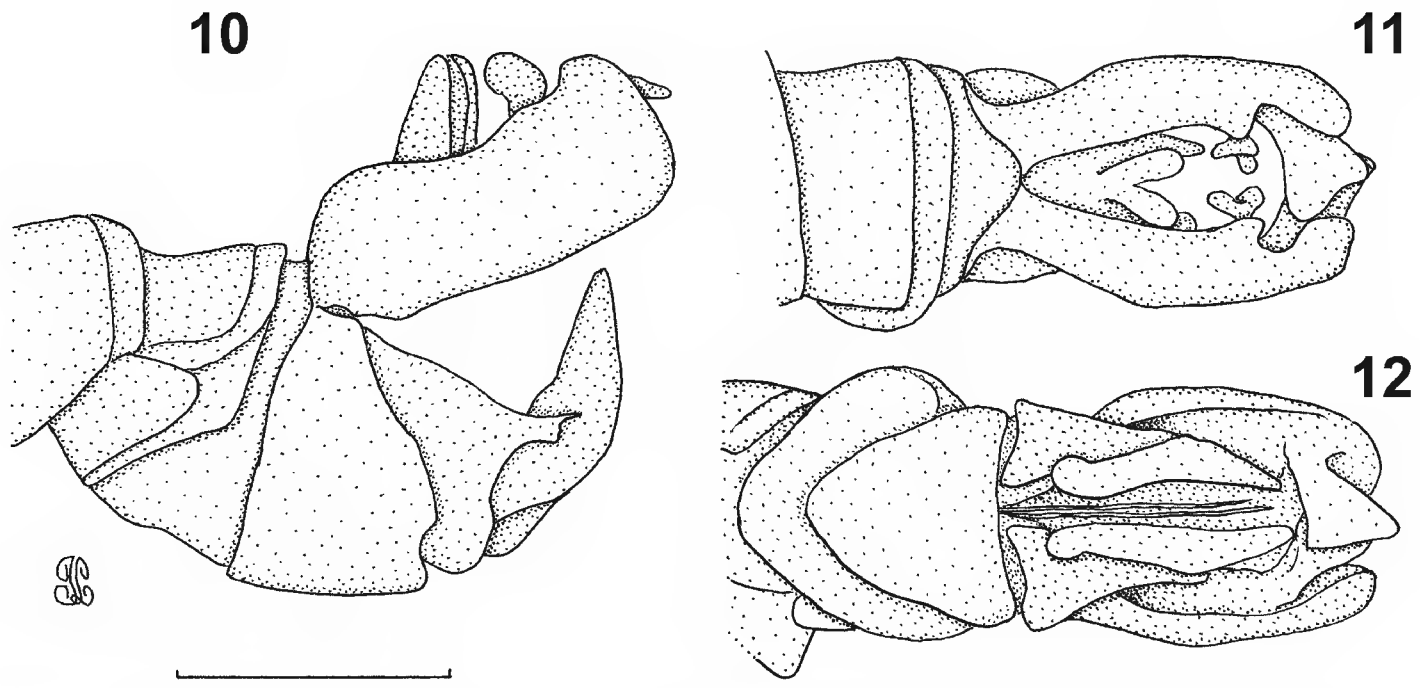
Note: The holotype specimen was previously assigned to *A. strachani* (see Londt 1982), but on closer inspection has rather different genitalia and is now considered dispecific.

Distribution, phenology and biology. Known only from the Chimaliro Forest Reserve in Malawi (Fig. 26). Collected in November and December (Table 1). Found associated with *Brachystegia* woodland.

Astochia neavensis (Ricardo, 1919)

Figs 10–12, 25

Neoitamus neavensis Ricardo, 1919: 72; Hull 1962: 557.



Figures 10–12. *Astochia neavensis* ♂ terminalia: **10** lateral **11** dorsal **12** ventral. Scale bar: 1 mm.

Astochia neavensis: Oldroyd 1980: 336; Londt 1982: 246 (figs 11 (wing), 12 (♀ ovipositor)).

Diagnosis. Mystax whitish. Katatergal setae whitish. Anatergite with white setae. Scutellum disc with minute yellow-white setae. Mesonotal macrosetae black. Wings: Discal cell microtrichose. Legs: Femora black and yellow-brown. Metathoracic femora lacking ventral macrosetae. ♀ with abdominal segments 1–5 pruinose. ♂ terminalia as in Figs 10–12.

In the absence of male specimens, the species was described on females alone. Londt (1982) redescribed the species, providing a description and illustration of the ovipositor. Now that a single male is available, which agrees well with the general description of females, it is now possible to provide the following description of the characteristic male terminalia.

Male terminalia (Figs 10–12): Unrotated. Epandrium almost 3× longer than wide in lateral view (Fig. 10), deeply incised dorsally with left and right sides narrowly joined at base; internal surfaces each with two well defined lobes, the ventral ones being large, subtriangular and extending distally beyond the dorsal elements. Hypandrium subtriangular in both lateral (Fig. 10) and ventral aspects (Fig. 12). Gonocoxite broad in lateral view, subtriangular and characteristically pointed distally. Gonostylus well developed, dorsally directed (Fig. 10). Aedeagus with long terminal filaments (Fig. 12).

Material. Previously recorded and personally studied material: DRC: 2♀, Lectotype and Paralectotype, 150–200 miles W. of Kambove [*c.* 10°53'S, 26°36'E], 3500–4000 ft, 25.x.1907, S.A. Neave. Lectotype NHMUK013659065, Paralectotype NHMUK01365906 (BMNH). 4♀ Paralectotypes, same data except 16.x.1907, NHMUK013659067–70 (BMNH).

Newly recorded material: DRC: 1♂ '150–200 miles / W. of Kambove [*c.* 10°53'S, 26°36'E]. / 3,500–4,500 ft. [*c.* 1220 m] / 16.10.07', 'Neave Coll. / 1907–230.'

(BMNH); 1♂ (now lacking terminalia) '150–200 miles / W. of Kambove. / 3,500–4,500 ft. [*c.* 1200 m] / 25.10.07', 'Neave Coll. / 1907–230' (BMNH). Tanzania: 1♀ 'Tanganyika: / Malagarasi [River *c.* 4°35'S, 30°39'E]. / 100 mls. E. of / Kigoma. 3,730 ft. [*c.* 1137 m] / 7–xi–1947.' 'M. Steele. / B.M. 1947–446.' (BMNH).

Distribution, phenology and biology. Recorded only for the DRC and Tanzania. While there is no certainty regarding the precise type locality, the coordinates of the nearest settlement (Kambove) serve to indicate its presence in the DRC (Fig. 25). Collected in October and November (Table 1). No biological information is available.

Astochia silva sp. nov.

http://zoobank.org/89AFBD7E-DEF4-4F04-A8C3-656E9BCF265C

Figs 13–19, 26

Etymology. L. *silva* (*sylva*) f. woods, trees, forest. Named after the forest habitat occupied by this species.

Description. Based on all material studied. Entire holotype as illustrated (Fig. 13).

Head: Dark red-brown to black, dull gold pruinose, black and yellow setose. Antenna dark red-brown to black, scape and pedicel black setose, postpedicel slightly laterally compressed. Relative lengths of segments (scape as 1) scape 1, pedicel 0.64, postpedicel 1.78, style 1.42 (0.14: 1.14: 0.14 – composed of a tiny basal element followed by a long, thin, stylus tipped with a tiny seta-like sensory element). Face black, ventral half protuberant, entirely strongly gold pruinose. Mystax mainly black with some yellow macrosetae centrally on epistomal margin, confined to protuberance. Frons black, gold pruinose. Vertex black, gold pruinose, strongly concave. Ocellar tubercle weakly pruinose, with *c.* 10 moderately developed ocellar macrosetae. Occiput uniformly gold pruinose, black (dorsally and along dorsal eye margins) and fine pale yellow to cream (ventrally) setose. Palps dark red-brown, single segmented, black (distally) and pale yellow (proximally) setose. Proboscis dark red-brown to black, straight, pale yellow setose.

Thorax: Dark red-brown to black, gold pruinose, black and pale yellow setose. Antepronotum dark red-brown, gold pruinose, black setose. Mesonotum dark red-brown to black, patterned with gold pruinescence (central longitudinal stripe and lateral patches dull apruinose), entirely black setose. Lateral macrosetae black (2 notopleurals, 2 supraalars, 2 postalars). Scutellum dark red-brown to black, entirely gold pruinose, with 6 (4 in paratypes) black apical macrosetae, disc fine black setose. Pleura dark red-brown to black, entirely gold pruinose, fine black and yellow setose. Katatergal setae moderately well developed, black. Anatergites fine black setose. Postmetacoxal area membranous.

Legs: Entirely black (♀ has orange tibiae with black distal ends). Coxae gold pruinose, mostly shiny yellow setose. Trochanters weakly yellow setose. Femora black (dorsally) and yellow (ventrally) setose. Tibiae and tarsi entirely black setose. Claws, pulvilli and empodia well developed.

Wings (Fig. 14) Length (humeral crossvein to tip) × breadth (maximum): Holotype ♂ 10.8 × 3.8 mm, paratype ♀ 12.8 × 3.9 mm, paratype ♂ 10.5 × 3.6 mm. Veins

Figure 13. *Astochia silva* sp. nov. entire ♂ holotype.

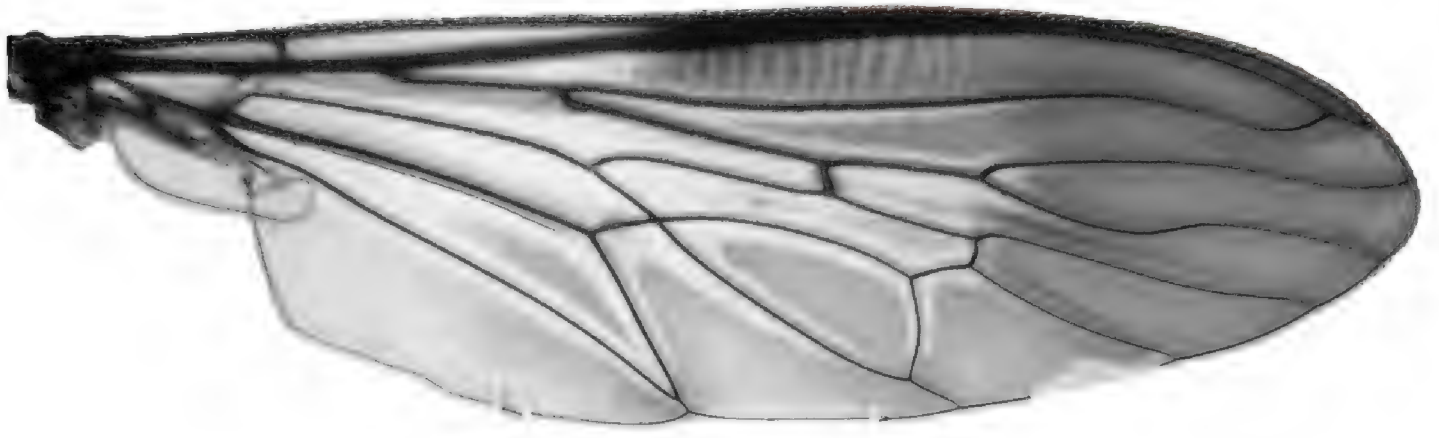
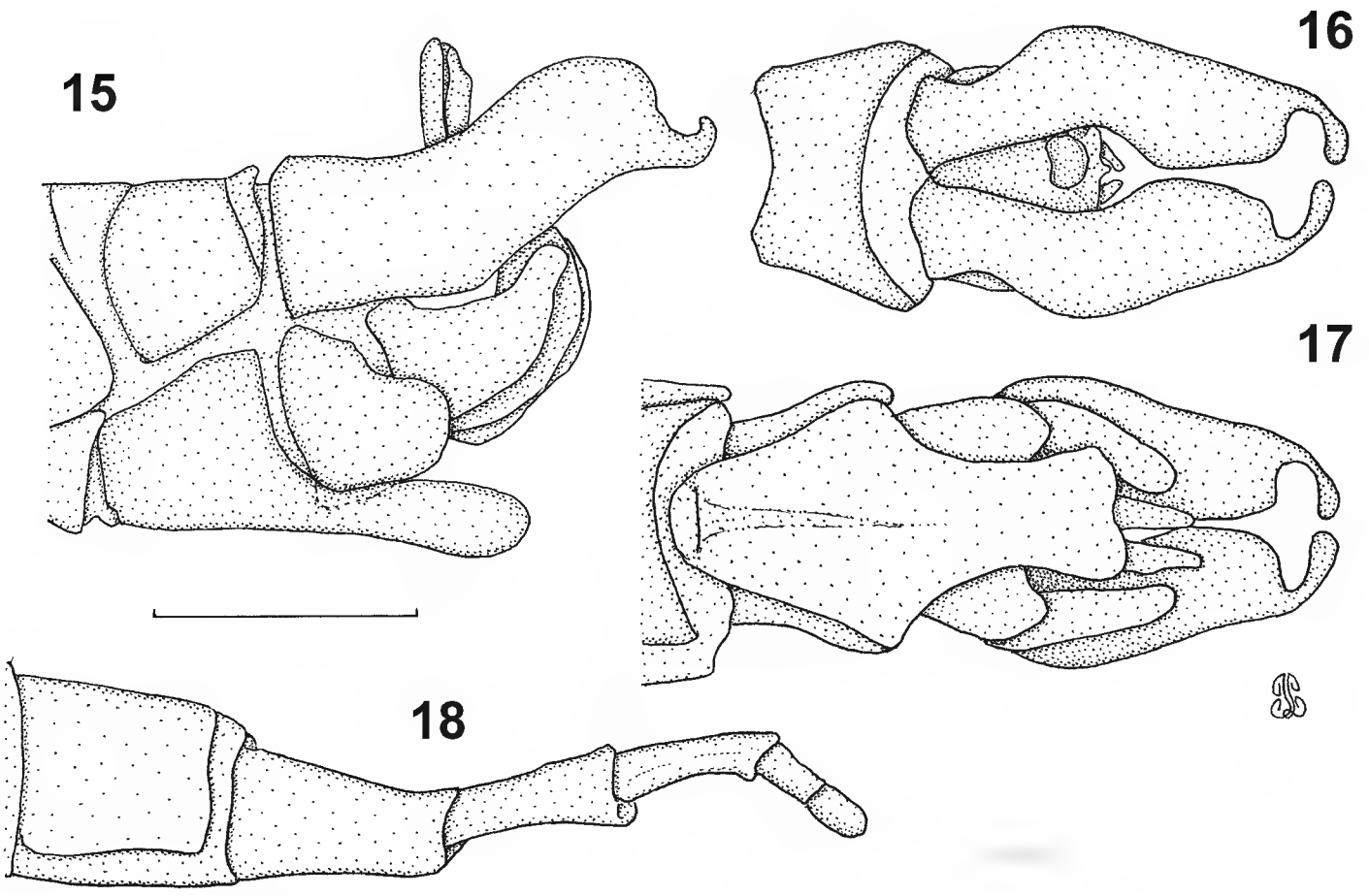


Figure 14. *Astochia silva* sp. nov. paratype ♂ wing.

dark red-brown to black, membrane transparent, marginally microtrichose, centrally lacking microtrichia, cells m_3 and *cua* closed and stalked.

***Abdomen*:** ♂ – dark red-brown to black, almost entirely gold pruinose (terminalia apruinose), mostly yellow setose (T1 and genitalia black and yellow setose). ♀ – as ♂ but T1–5 pruinose, T6–9 telescopic and apruinose).

Male terminalia (Figs 15–17): Unrotated. S8 with posterior region greatly extended distally, almost twice as long as broad in ventral view (Fig. 17). Epandrium 3× longer than wide in lateral view (Fig. 15), deeply incised dorsomedially with left and right sides narrowly joined near base; distal ends narrowed to form fairly elongate, convergent lobes. Hypandrium relatively small with slightly projecting, broad, ventral lobes (Fig. 17). Gonocoxite subtriangular in lateral view with some-



Figures 15–18. *Astochia silva* sp. nov. terminalia: **15, 17** Paratype ♂ **15** lateral **16** dorsal **17** ventral **18** Paratype ♀ lateral. Scale bar: 1 mm.

what elongate, distally rounded lobes (Fig. 15). Gonostylus well developed, dorsally directed (Fig. 15).

Female terminalia (Fig. 18 – not dissected): Ovipositor telescopic and comprising segments 6–9.

Type material. Holotype. Kenya: ♂ 'Kenya: W Kakamega #73 / Kakamega Forest Reserve / 00°22'N, 34°53'E 1620m / Date: 24.xi.1992 / A Whittington & J Londt / Indigenous forest paths', 'Prey Identification / Order: Diptera / Family: Calliphoridae / Other: ... / Det: JGH Londt', 'Asilprey 001895', 'NMSA-DIP-106722', 'Asilprey 001895' (NMSA).

Paratypes. Kenya. 1♂ 1♀: Same collecting data as holotype. 1♂ 'NMSA-DIP-106723'; 1♀ 'NMSA-DIP-106724' (NMSA), 1♀ 'Brit. E. Afr. / S.E. Slopes / of Kenya [Mount Kenya *c.* 0°09'S, 37°19'E] / 6,000–7,000 ft. [*c.* 1980 m] / Feb. 3–12, 1911. / S.A. Neave', 'E preying / on F', 'Pres. by / Imp. Bur. Ent. / 1921–9.', '*Astochia* sp. / det J.G.H. Londt, 1981' – Prey pinned alongside 'Brit. E. Afr. / S.E, Slopes / of Kenya / 6,000–7,000 ft. / Feb. 3–12, 1911. / S.A. Neave', 'F prey / of E [Coleoptera: Staphylinidae]', 'Pres. by / Imp. Bur. Ent. / 1921–9.' (BMNH). **Paratype.** Burundi: 1♀ 'Burundi, Bururi / National Forest / 1955m. 3.93022S, 29.61697°E [03°55'49"S, 29°37'01"E 2010m]', 'Malaise trap, edge of / indigenous forest / 23 Mar – 6 Apr 2014 / R. Copeland' (ICIPE).

Distribution, phenology and biology. Recorded from Kenya and Burundi (Fig. 26). Collected from November to March (Table 1); no records for December and January. Found associated with indigenous forests. Fig. 19 shows the habitat in which the species has been found in the Bururi National Forest, Burundi. Two prey items are associated with specimens (Coleoptera: Staphylinidae, Diptera: Calliphoridae).

Figure 19. *Astochia silva* sp. nov. habitat at Bururi National Forest (Photo: Bob Copeland – 10 August 2010).

***Astochia similis* sp. nov.**
http://zoobank.org/241320E1-1B99-4791-A666-E192A3A220DF
Figs 20–23, 26

Etymology. L. *similis*, like, resembling. So named because of a close resemblance to *A. sodalis*.

Description. Based on unique holotype specimen.

***Head*:** Dark red-brown to black, silver pruinose, black and white setose. Antenna dark red-brown to black, scape and pedicel black and white setose, postpedicel slightly laterally compressed. Relative lengths of segments (scape as 1) scape 1, pedicel 0.6, postpedicel 1.5, style 2.2 (0.1: 2.0: 0.1 – composed of a tiny basal element followed by a long, thin, seta-like element and tipped with a tiny sensory element). Face black, ventral 2/3 slightly protuberant, entirely strongly silver pruinose. Mystax entirely white, confined to protuberance. Frons black, silver pruinose, black and white setose. Vertex black, silver pruinose, strongly concave. Ocellar tubercle weakly pruinose, with *c.* 6 black, weakly developed ocellar macrosetae. Occiput uniformly silver pruinose, few black (dorsally) and white setae. Palps dark red-brown, single segmented, white setose. Proboscis dark red-brown to black, straight, white setose.

***Thorax*:** Dark red-brown to black, silver pruinose, black and white setose. Antepronotum dark red-brown, silver pruinose, white setose. Mesonotum dark red-brown to black, patterned with silver pruinescence (central longitudinal stripe and lateral

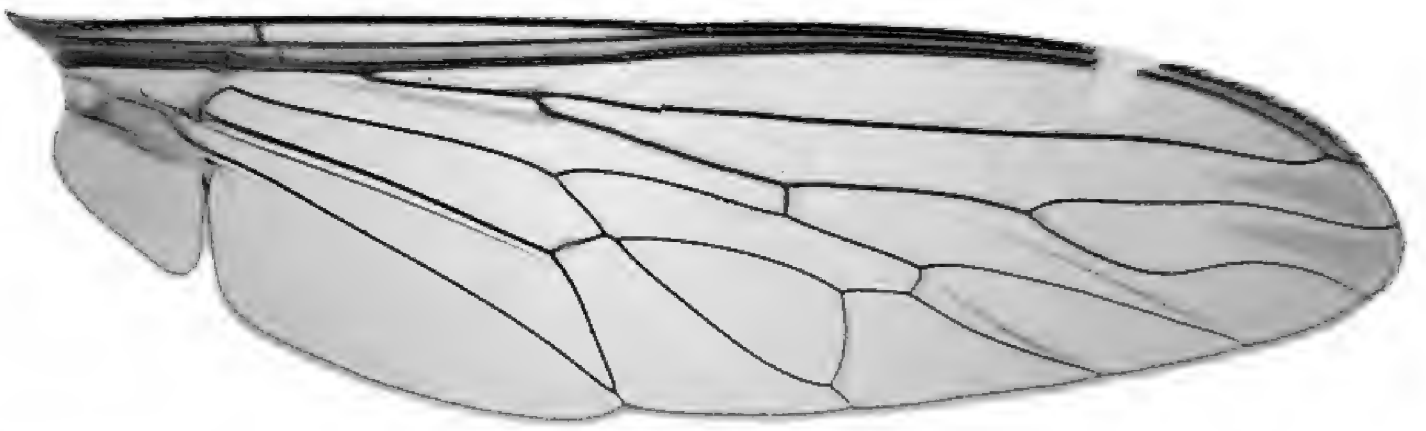


Figure 20. *Astochia similis* sp. nov. ♂ holotype wing.

patches apruinose), entirely black setose except for postpronotal lobes and posterior margin which are fine white setose. Lateral macrosetae black (1 posthumeral, 2 notopleurals, 2 supra-alars, 2 postalars). Scutellum dark red-brown to black, entirely silver pruinose, with 2 black apical macrosetae, disc fine white setose. Pleura dark red-brown, entirely silver pruinose, fine white setose. Katatergal setae moderately well developed, white. Anatergites fine white setose. Postmetacoxal area membranous.

***Legs*:** Orange-brown except for anterior surfaces of femora which are dark red-brown. Coxae silver pruinose, white setose. Trochanters weakly white setose. Femora black and white setose. Tibiae and tarsi mostly black setose. Claws, pulvilli and empodia well developed.

Wings (Fig. 20) Length (humeral crossvein to tip) x breadth (maximum): 9.5 × 3.1 mm. Veins dark red-brown, membrane transparent, weakly microtrichose distally (confined to small areas of cells *c*, *sc*, r_1, r_{2+3}, r_4, r_5, m_1), cells m_3 and *cua* closed and stalked.

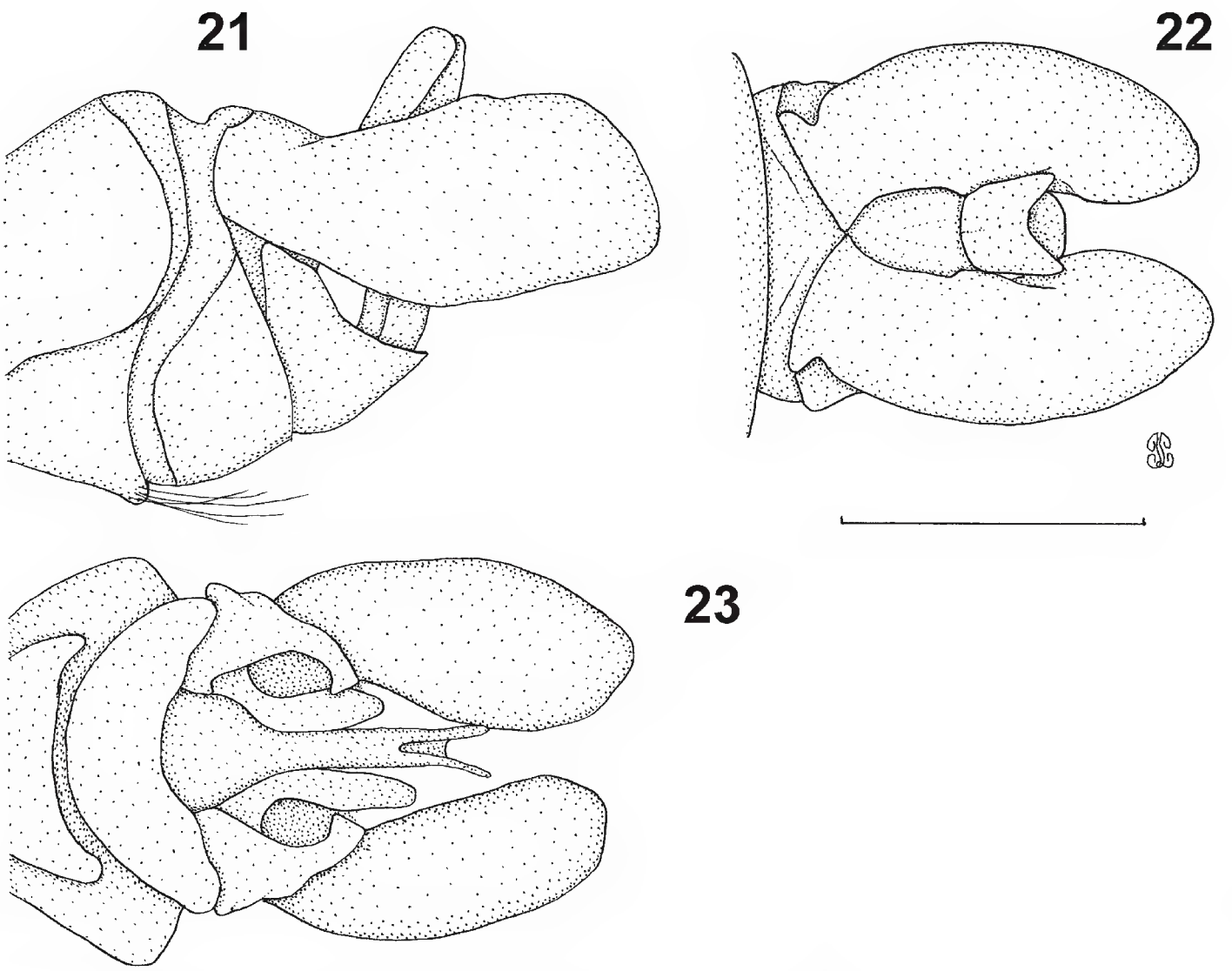
***Abdomen*:** Dark red-brown to black, silver pruinose, black and white setose.

Male terminalia (Figs 21–23): Unrotated. Epandrium simple, *c.* twice as long as high in lateral view (Fig. 21), distally rounded. Dorsally epandrial lobes almost circular in appearance, each lobe lacking obvious projections. Proctiger simple, dorsal lobes appear fused medially, and distal ends diverge. Hypandrium relatively moderately developed, hind margin straight (Fig. 23). Gonocoxite subtriangular in lateral view, somewhat pointed distally (Fig. 21), distal lobes converging in ventral view (Fig. 23). Gonostylus moderately well developed, lobelike, gently dorsally directed and slightly divergent. Aedeagus well developed, relatively stout and appearing forked distally (Fig. 23).

Female: Unknown.

Type material. Holotype. Nigeria: 1♂ holotype 'Nigeria / Soedan Savanne [?] – / Zône – febr, '74 / leg: Feith en den Boer', 'NMSA-DIP-03385' (NMSA).

Distribution, phenology and biology. Known only from Nigeria. While no precise location is recorded the words 'Soedan Savanne' suggest a north-easterly location, perhaps near Lake Chad (*c.* 11°N, 12°E – Fig. 26), where the environment could be described as savanna. Collected in February (Table 1).



Figures 21–23. *Astochia similis* sp. nov. ♂ holotype terminalia: **21** lateral **22** dorsal **23** ventral. Scale bar: 1 mm.

Astochia sodalis (Wulp, 1899)

Figs 3, 26

Itamus sodalis Wulp, 1899: 96 (Plate III fig. 11 (♂ terminalia, 12 (♀ terminalia) 13 (wings)).
Astochia sodalis; Hull 1962: 549; Oldroyd 1980: 336; Londt 1982: 247 (figs 13 (wing) 14–16 (♂ terminalia)).

Diagnosis. Mystax whitish. Katatergal setae whitish. Anatergite with white setae. Scutellum disc with minute yellow-white setae. Mesonotal macrosetae yellow-white. Wings: Discal cell lacking microtrichia. Legs: Femora black and yellow-brown. ♀ with abdominal segments 1–6 pruinose. ♂ terminalia as in Fig. 3. The species was fully redescribed by Londt (1982).

Material. Previously recorded and personally studied material: Iran: 1♂ 2♀ [only 1♀ recorded by Londt (1982)], Multan [*c.* 27°01'N, 61°51'E 1265m], 5.vii.1963, G. Popov (BMNH).

Material not studied but previously recorded by Wulp (1899): South Yemen: 1♂ 1♀ from Haithalhim [? – Wulp (1899) states that Haithalhim is 19 miles from Aden.] and Lehej [Lahij *c.* 13°03'N, 44°53'E 135m].

Distribution, phenology and biology. Known only from Iran, in the Palaearctic Region, and South Yemen (Fig. 26). Collected in July (Northern Hemisphere summer) (Table 1). Biology unknown.

Astochia strachani Oldroyd, 1970

Figs 4, 24, 26

Astochia strachani Oldroyd, 1970: 312; Londt 1982: 249 (figs 17 (wing) 18–20 (♂ terminalia)).

Diagnosis. Mystax whitish. Katatergal setae black and whitish. Anatergite with white setae. Scutellum disc with minute yellow-white setae. Mesonotal macrosetae black. Wings: Discal cell lacking microtrichia. Legs: Femora black and yellow-brown. Metathoracic femora with ventral macrosetae. ♀ with abdominal segments 1–5 pruinose. ♂ terminalia as in Fig. 4. The species was fully redescribed by Londt (1982).

Material. Previously recorded and personally studied material: Kenya: 2♂ 2♀ 'Kenya Eastern / Katulani Kitui dist. [*c.* 01°22'S, 38°10'E 1150m] / malaise trap 26.x.1990 / J.A.M. Jansen', 'NMSA-DIP 106725-8' (NMSA). NIGERIA: 4♂ 2♀, holotype & paratype, Lagos [*c.* 06°31'N, 03°23'E 10m], G. Strachan (BMNH).

Material not studied but recorded by Oldroyd (1970): DRC: 1♂ 3♀, Costermansville [= Bukavu *c.* 02°31'S, 28°51'E 1685m], Kasongo [?], viii–ix.1959, J. Claessens (MRAC); 2♂ 1♀, Costermansville, Kapiti [?], iv.1912, Miss. Agric. (MRAC); 1♂, Lomani, Luputa [*c.* 07°10'S, 23°43'E 875m], ix.1935, Dr Bomans (MRAC); 1♂, Katanga, Elizabethville [= Lubumbashi *c.* 11°41'S, 27°30'E 1245m], route Sakania, 21.viii.1952, L. Remy (MRAC). Sierra Leone: 1♂, Nzala [*c.* 08°06'N, 12°03'W 67m], 23.iii.1962, M. Rushton (MRAC).

Newly recorded material: Ivory Coast: 1♂ 'Côte D'Ivoire: 28 km / W Bouaflé. Maraoué / Nat Park 19.iv.1989 / 06°59'N, 05°54'W [*c.* 205m] / JGH Londt. Woodland / and forest margins', 'NMSA-DIP-03394' (NMSA). Kenya: 1♀ 'Kenya, Rift Valley / Prov., Olloitokitok [Oloitokitok] / 1853m. 2.94456S, 37.50714E [*c.* 02°57'S, 37°30'E]', 'Malaise trap, edge of / indigenous forest / 11–25 Nov 2011 / R. Copeland' (ICIPE). Malawi: 1♀ 'A>A1 / Mt. Mlanje [Mulanje Massif *c.* 15°55'S, 35°39'E], / Nyasaland, / 6.xi.1913. / S.A. Neave', 'Pres. by / Imp. Bur. Ent. / 1921–9,' '*Philodicus* / sp indet', 'BMNH (E) 664089' – Prey pinned alongside 'A1<A / Mt. Mlanje, / Nyasaland, / 6.xi.1913. / S.A. Neave', 'Pres. by / Imp. Bur. Ent. / 1921–9,', 'Pres. by / Imp. Bur. Ent. / 1921–9,', 'Anthomy / idea [Diptera] / det. 1936 / J. Smart.' (BMNH); 1♀ 'Malawi Mulanje Mnt. / Likabula river valley [*c.* 15°59'S, 35°40'E 775m] / 28–30.xi.1980 1535Dc / 1000m Stuckenberg & / Londt Riverine / *Brachystegia* woodland', 'NMSA-DIP-03362' [previously recorded as *africana*] (NMSA). Uganda: 3♂ 1♀ Ankole, Kichwamba [*c.* 0°13'14"S, 30°05'54"E 1155m], 23–29.iv.1968, P.J. Spangler (USNMENT01518175–8).

Distribution, phenology and biology. Widely distributed from East Africa (Kenya, Malawi, Uganda) through Central Africa (DRC) to West Africa (Ivory Coast, Nigeria, Sierra Leone) (Fig. 26), straddling the equator. Collected in March and April

Figure 24. *Astochia strachani* habitat at Oloitokitok (Photo: Bob Copeland – 22 July 2011).

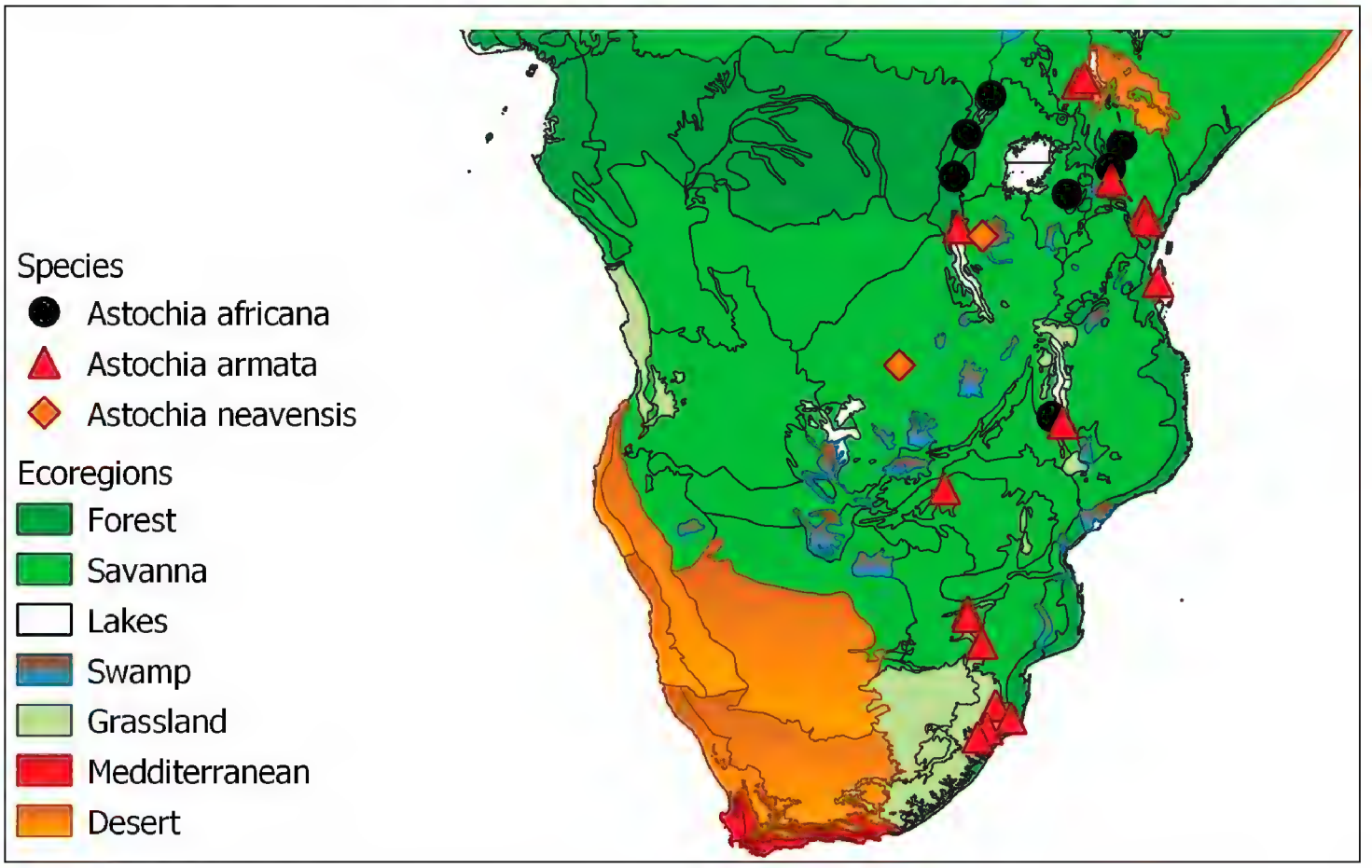


Figure 25. Distribution of *Astochia* species: *A. africana*, *A. armata*, *A. neavensis*.

as well as August through to November (Table 1). Found mainly associated with indigenous forest and woodland environments. Fig. 24 shows the habitat in which the species was collected at Oloitokitok in Kenya. A single prey item has been preserved (Diptera: Anthomyiidae).

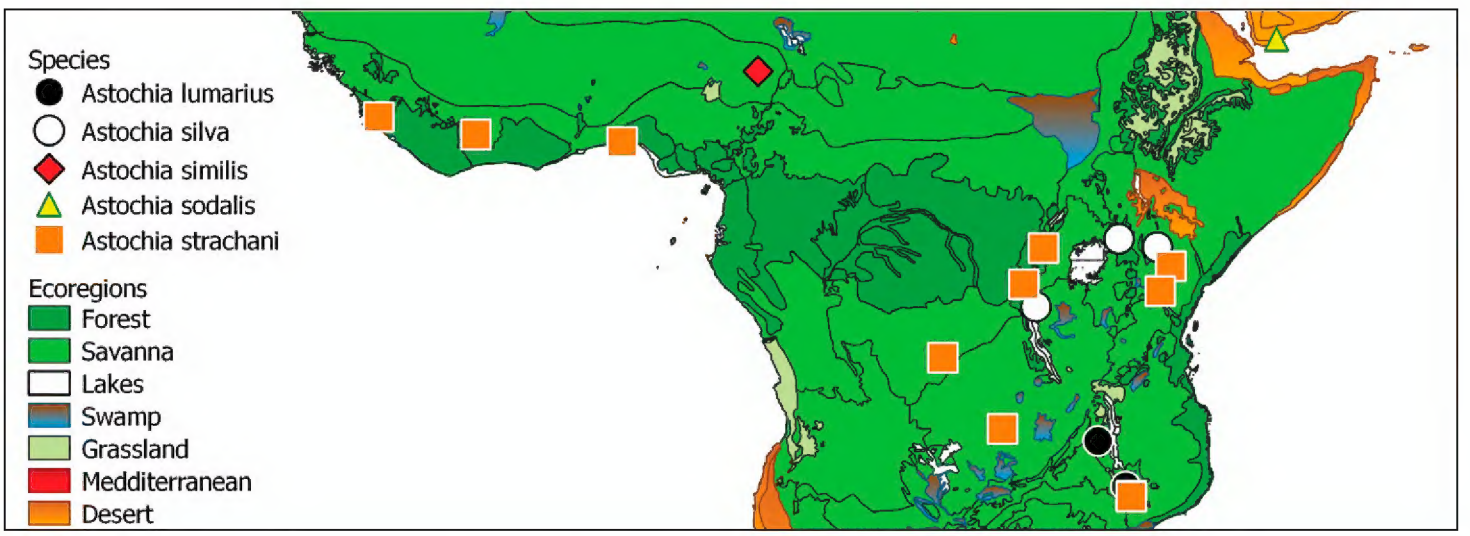


Figure 26. Distribution of *Astochia* species: *A. lumarius* sp. nov., *A. silva* sp. nov., *similis* sp. nov., *A. sodalis*, *A. strachani*.

Key to species of *Astochia*

1 Mesonotal macrosetae black; wing with at least small areas microtrichose **2**

– Mesonotal macrosetae white; wing entirely lacking microtrichia; ♂ terminalia as in Fig. 3 (see also Londt (1982) figs 15–17) ..... ***A. sodalis* (Wulp)**

2 Apical scutellar macrosetae present..... **3**

– Apical scutellar macrosetae absent ♂ terminalia as in Figs 10–12..... ..... ***A. neavensis* (Ricardo)**

3 Metathoracic femora with ventrally situated macrosetae..... **4**

– Metathoracic femora lacking ventrally situated macrosetae; ♂ terminalia as in Fig. 2 (see also Londt (1982) figs 8–10) ..... ***A. armata* (Becker)**

4 Femora entirely black..... **5**

– Femora mainly or partly orange-brown..... **6**

5 Anatergal setae white; ♂ terminalia as in Fig. 1 (see also Londt (1982) figs 4–6); S8 medially slightly pointed, not extending beyond limits reached by hypandrium..... ***A. africana* (Ricardo)**

– Anatergal setae black; ♂ terminalia as in Figs 15–17; S8 medially greatly elongate, lobelike, extending well beyond limits reached by hypandrium..... ..... ***A. silva* sp. nov.**

6 Mystax entirely pale yellow-white; microtrichia of wing confined to small patches at distal ends of cells r_1, r_{2+3}, r_4 and r_5; ♂ terminalia as in Figs 21–23 ..... ***A. similis* sp. nov.**

– Mystax extensively black; microtrichia extensively distributed over all terminal wing cells 7

7 Antennal scape white setose; ♂ terminalia as in Fig. 4 (see also Londt (1982) figs 18–20)..... ***A. strachani* Oldroyd**

– Antennal scape black setose; ♂ terminalia as in Figs 8, 9..... ..... ***A. lumarius* sp. nov.**

Comments

While *Astochia* females have distinctive telescopic ovipositors, males do not appear to have any highly distinctive characteristics. In addition, little, if anything, is known of their biology. The telescopic ovipositors suggest that females oviposit in cracks and crevices, probably associated with vegetation, living or dead (i.e. category 5b in Londt's (1994) ethological classification). It is presumed that eggs hatch where they are laid and that the larvae then fall to the ground and burrow into it in order to continue development. Evidence suggests that the larger, darker species live in association with indigenous forests while the smaller, lighter coloured species are likely to inhabit more open woodland and even savannah biomes. Those individuals personally encountered appeared to frequent vegetation close to the ground.

Distributions are largely centred on equatorial East Africa, although *A. strachani* has a far wider distribution that extends into West Africa. *A. sodalis* is clearly exceptional in that it has been recorded from the far north-eastern region of the Afrotropical Region in addition to its type-locality in Iran which lies in the Palaearctic Region. The fact that this is also the only species possessing a relatively short ovipositor, comprising only the last three segments, as opposed to four in the other species, suggests that it may indeed be misplaced and that it is actually an unrelated Palaearctic taxon. Clearly, additional material and further studies are required in order to clarify this matter.

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